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Aerial surveys of Nearctic shorebirds wintering in Mexico: Some preliminary results

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Abstract

Aerial surveys of the northwest Mexico/Baja California coastlines were carried out in late January/early February 1992 to determine the distribution and numbers of wintering Nearctic shorebirds, as the first year of a planned three-year Mexican Shorebird Atlas Project. A total of 815 531 shorebirds was observed during the surveys, with almost 86% (697 722) occurring in four key wetland areas: (1) Laguna Ojo de Liebre (256 939) on the Pacific coast of Baja California, (2) coastal wetlands between Culiacan and Los Mochis (166 647), (3) Rio Colorado estuary (163 744) at the northern end of the Gulf of California, and (4) the wetlands of Estero Tobari and Estero Lobos (110 392). Small shorebirds were the most abundant group (563 207), consisting principally of "peeps" (mostly Western Sandpipers) (556 561) in areas with soft mudflats and Sanderlings (6646) on ocean beaches. Large shorebirds (117 773) were the second most numerous category: American Avocets (30 643) and Black-necked Stilts (953) were most common in the major wetlands of Sinaloa/Sonora states, whereas Marbled Godwits (30 466) and Willets (17 497) were widely distributed both in those areas and in the wetlands of Baja California. Amongst the medium-sized shorebirds (68 175), dowitchers (mostly Long-billed Dowitchers) were most common and were widely distributed; sightings of Red Knots suggest that moderate numbers may winter in the area. The four areas identified above are clearly of major international importance for wintering populations of Nearctic shorebirds in Mexico and would qualify for inclusion in the Western Hemisphere Shorebird Reserve Network.

Resumen

A fines de enero y principios de febrero de 1992 se realizaron observaciones aéreas en las costas del noroeste de México y Baja California para determinar la distribución y cantidades de aves playeras del Neártico que habían invernado, como parte del primer año de trabajo en el Proyecto de Atlas de las Aves Playeras mexicanas, de tres años de duración. Se observó un total de 815.531 aves playeras durante los estudios, observándose casi 86 % (697.722) en cuatro zonas claves de humedales: (1) la Laguna Ojo de Liebre (256.939) en la costa del Pacífico de Baja California, (2) los humedales costeros entre Culiacán y Los Mochis (166.647), (3) el estuario del Río Colorado (163.744) en el extremo norte del Golfo de California, y (4) los humedales del Estero Tobari y del Estero Lobos (110.392). El grupo más abundante fue el de aves playeras pequeñas (563.207), compuesto principalmente por *Calidris mauri* (556.561) en zonas de marismas y *Calidris alba* (6.646) en las playas océanicas. La segunda categoría más numerosa fue la de aves playeras grandes (117.773): *Recurvirostra americana* (30.643) y *Himantopus mexicanus* (953) fueron las más comunes en los mayores humedales de los estados de Sinaloa y Sonora, mientras *Limosa fedoa* (30.466) y *Catoptrophorus semipalmatus* (17.497) estaban ampliamente distribuidas en aquellas zonas y en los humedales de Baja California. Entre las aves de tamaño mediano (68.175), la más común fue *Limnodromus scolopaceus* y estaba distribuida por todas partes; la observación de *Calidris canutus* sugiere que probablemente una cantidad moderada de ellos pasa el invierno en la región. Las cuatro zonas identificadas arriba tienen claramente una importancia internacional para las poblaciones de aves playeras del Neártico que pasan el invierno en México y cumplen con los requisitos para ser incluidas en la Red Hemisphérica de Reservas de Aves Playeras.

Introduction

Mexico has an extensive coastal zone, with an estimated 6760 km of coastline on the Pacific Ocean and 2900 km on the Gulf of Mexico, which is known to contain a number of areas of major international importance for waterfowl (Scott and Carbonell 1986). Whereas aerial surveys for ducks, geese, and Neotropical water birds have been carried out for many years in Mexico, little specific information is available on populations of Nearctic shorebirds either wintering in or migrating through these areas. Aerial surveys over extensive geographical areas in recent years in both South America (Morrison and Ross 1989) and North America (Morrison and Myers 1989; Morrison 1992) have demonstrated that many species concentrate to a remarkable degree both during the winter and on migration. These studies have led to the development of the Western Hemisphere Shorebird Reserve Network, which seeks to protect all the key sites used by the birds throughout their annual cycle and thus to maintain the integrity of the system of habitats upon which the birds depend for their survival.

With the completion of a first set of wintering shorebird surveys in South America (Morrison and Ross 1989) and surveys of potential wintering areas in Panama (R.I.G. Morrison, R. Butler, R.K. Ross, and F. Delgado, unpubl.), Mexico contains the last remaining major shoreline in Latin America for which use by wintering Nearctic shorebirds has not been assessed, a key requirement for future conservational planning and further development of the Western Hemisphere Shorebird Reserve Network.

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This report presents preliminary results of the first year of a planned three-year Mexican Shorebird Atlas Project, involving aerial surveys of the northwest Mexico/Baja California coastlines carried out in late January/early February 1992 to determine the distribution and numbers of wintering Nearctic shorebirds. The project is being carried out under the Canada/Mexico/USA Tripartite Agreement and is part of the Canadian Wildlife Service Latin American Program.

Methods

Aerial surveys of the northwestern coast of Mexico were carried out between 29 January and 4 February 1992 from Culiacan, Sinaloa State, around the coast of the Gulf of California and Baja California peninsula to the Mexico/US border. Flight itineraries and conditions are shown in Table 1. Survey procedures essentially followed those used in the South American Shorebird Atlas Project, as described by Morrison and Ross (1989), and may be summarized as follows. Surveys were conducted in a Cessna 210 fixed-wing aircraft flying at approximately 40–50 m above ground level and at an airspeed of 160–240 km/h, depending on the densities of shorebirds being encountered and the circuitousness of the flight path. The flights followed a line roughly 25 m offshore of the water's edge, with the two principal observers (RIGM and RKR) looking inland from the co-pilot's seat and the seat behind, respectively. All shorebirds seen were counted and observations recorded directly onto audio cassettes for later transcription. The third observer (STM) made habitat descriptions, alerted the principal observers to occasional groups of shorebirds that flushed to the left of the aircraft, and counted other species of interest. Every effort was made to cover all habitats, including lagoons, that were appropriate for those shorebirds that forage in the intertidal zone. Flights were carried out mostly between 09:00 and 17:30 local time in order to avoid glare caused by low sun angle (see Table 1).

Numbers of shorebirds were determined by direct counting when flocks were small or by visual estimation when larger concentrations were encountered. Identifications were made at the species level wherever possible, although birds had to be assigned to size categories (Table 2) when viewing conditions and/or the size and diversity of the flocks did not allow some species to be identified. The aircraft's position throughout the survey was accurately determined through onboard LORAN and GPS systems and by regular time checks at and between known geographical locations. After the survey, the shoreline covered was divided into sectors (Fig. 1) to facilitate analysis. Sectors generally represent units of reasonably homogeneous habitat (e.g., sandy beach, estuarine mudflat, mangrove complex), usually bounded by obvious landmarks. Shorebird counts obtained by each principal observer were compared for each sector and the higher counts for each species and/or size group used in the analysis. Small, but occasionally important, differences in counts may have resulted when an observer was temporarily involved in navigation, photography, or equipment checks. The survey results have been summarized at the sector level.

Results

A total of 815 531 shorebirds was observed during the surveys, consisting of 563 207 small shorebirds (69.1%), 68 175 medium-sized shorebirds (8.4%), 117 773 large shorebirds (14.4%), and 66 376 unidentified shorebirds (8.1%) (Table 3).

Shorebirds were generally concentrated in a number of key areas, which held substantial numbers of birds making up a significant proportion of the totals in each category (Table 4). The four most important areas, which held 697 722 shorebirds or 85.6% of the survey total, were as follows:

(1) Laguna Ojo de Liebre on the Pacific coast of the Baja California peninsula: this extensive system held a total of 256 939 shorebirds, comprising 31.5% of the birds observed on the surveys.

(2) Coastal wetlands between Culiacan and Los Mochis: this series of bays includes the important areas of Bahia de Santa Maria and the Topolobampo system and held a total of 166 647 shorebirds, making up 20.4% of the survey total.

(3) Rio Colorado estuary: the enormous mudflats at the mouth of the delta of the Rio Colorado held some 163 744 shorebirds, or 20.1% of the survey total.

Table 1
Summary of information on 1992 aerial surveys along the coast of northwest Mexico

Date	Time	Coverage	Weather
29 January	14:15–17:15	Punta Colorada – Estero Lobos	Clear, light wind, 20°C
30 January	09:20–11:00	Estero Lobos – Kino Nuevo	Clear, calm, 20°C
	12:45–15:50	Kino Nuevo – Rio Colorado	Clear, calm, 20°C
31 January	10:45–11:50	Rio Colorado – San Felipe	Clear, light wind, 20°C
	12:50–15:50	San Felipe – Loreto	Clear, becoming cloudy, moderate wind, 18°C
	16:30–17:50	Loreto – La Paz	Overcast and clearing, light wind, 16°C
1 February	09:00–10:40	La Paz – Los Innocentes	Clear, light wind, 14°C
	12:00–14:00	Los Innocentes – La Bocana	Clear, moderate wind
2 February	10:15–12:20	La Bocana – Bahia Asuncion	Scattered cloud, moderate wind
	15:10–17:40	Bahia Asuncion – Guerrero Negro	Broken cloud, squalls, moderate wind
3 February	10:00–13:00	Guerrero Negro – Tijuana	Hazy, light wind, 15°C
4 February	12:00–12:30	Lagoons from Boca las Piedras to	Clear, calm, 20°C
	14:00–15:30	Punta Colorada	

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Figure 1
Survey sectors and coverage during 1992 aerial surveys for shorebirds along the coast of northwest Mexico

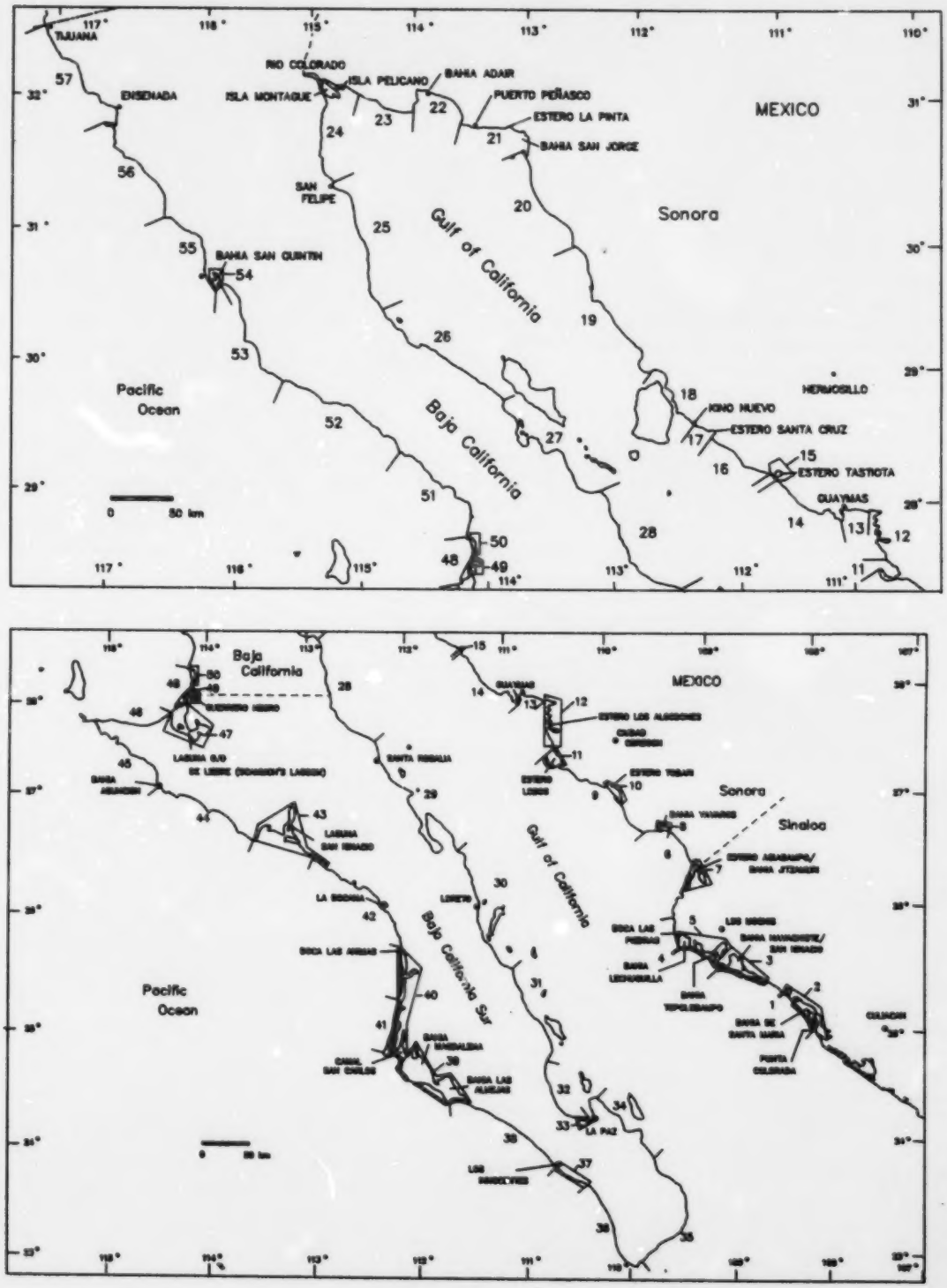

Table 2
Size categories of species of Nearctic shorebirds observed during the 1992 aerial surveys along the coast of northwest Mexico

Common name	Latin name	Code[a]
Small		
Snowy Plover	*Charadrius alexandrinus*	SNPL
Wilson's Plover	*Charadrius wilsonia*	WIPL
Semipalmated Plover	*Charadrius semipalmatus*	SEPL
Spotted Sandpiper	*Actitis macularia*	SPSA
Sanderling	*Calidris alba*	SAND
Western Sandpiper	*Calidris mauri*	WESA
Least Sandpiper	*Calidris minutilla*	LESA
Pectoral Sandpiper	*Calidris melanotos*	PESA
Dunlin	*Calidris alpina*	DUNL
Medium-sized		
Black-bellied Plover	*Pluvialis squatarola*	BBPL
Killdeer	*Charadrius vociferus*	KILL
Greater Yellowlegs	*Tringa melanoleuca*	GRYE
Lesser Yellowlegs	*Tringa flavipes*	LEYE
Wandering Tattler	*Heteroscelus incanus*	WATA
Ruddy Turnstone	*Arenaria interpres*	RUTU
Black Turnstone	*Arenaria melanocephala*	BLTU
Surfbird	*Aphriza virgata*	SURF
Red Knot	*Calidris canutus*	REKN
Stilt Sandpiper	*Calidris himantopus*	STSA
Long-billed Dowitcher	*Limnodromus scolopaceus*	LBDO
Short-billed Dowitcher	*Limnodromus griseus*	SBDO
Large		
American Oystercatcher	*Haematopus palliatus*	AMOY
American Black Oystercatcher	*Haematopus bachmani*	BLOY
Black-necked Stilt	*Himantopus mexicanus*	BNST
American Avocet	*Recurvirostra americana*	AMAV
Willet	*Catoptrophorus semipalmatus*	WILL
Whimbrel	*Numenius phaeopus*	WHIM
Long-billed Curlew	*Numenius americanus*	LBCU
Marbled Godwit	*Limosa fedoa*	MAGO

[a] Other codes: PEEP = small sandpipers
YELL = yellowlegs
DOWI = dowitchers

(4) The wetlands of Estero Tobari and Estero Lobos: these wetlands together held 110 392 shorebirds, making up 13.5% of the survey total.

Other areas holding more than 10 000 shorebirds included Estero Agiabampo/Bahia Jitzamuri (19 597) and Bahia Yavaros (14 388) north of Los Mochis, Bahia Adair (12 700) near Puerto Peñasco, and Laguna San Ignacio (16 402) and Laguna Guerrero Negro (10 779) on the Baja California peninsula.

Small shorebirds (Table 5)

Small shorebirds were by far the most abundant group of shorebirds observed during the surveys, making up 563 207 of the total of 815 531. It was possible to distinguish Sanderlings from the air during the surveys, although other small shorebirds were grouped together in the general category of "peeps."

Peeps. The most abundant species making up the peep category was undoubtedly the Western Sandpiper. It was not possible to distinguish between the various species of small sandpipers and other species of shorebirds in this category from the air, and peeps will have included some Semipalmated Sandpipers, Dunlins, Semipalmated Plovers, and other species listed in Table 2, although certainly in considerably lower numbers than Western Sandpipers. Most peeps were found in estuarine habitats, embayments, or flooded open areas of mud, usually where the sediments were soft and/or fine in texture. Such habitats were most common in the coastal wetlands of Sinaloa and Sonora states, especially in the Bahia de Santa Maria/Topolobampo areas, and in the estuary of the Rio Colorado, where the majority of peeps were found on the soft mudflats at the outer tips of Isla Montague and Isla Pelicano facing the Gulf of California. Large numbers of peeps were also found on the soft mudflats in the relatively sheltered waters of the Laguna Ojo de Liebre on the Pacific coast of Baja California.

Sanderling. A total of 6646 Sanderlings was observed during the surveys. Sanderlings were found principally on the ocean beaches of Sinaloa and Sonora states (40% of the total) and on the west coast of Baja California facing the Pacific Ocean (60% of the total). Very few Sanderlings occurred on the mostly rocky coastlines of the eastern shore of Baja California. Highest concentrations occurred on the outer barrier beaches around Bahia de Santa Maria/Topolobampo, on the beaches to the east of the mouth of the Colorado River, and on the central parts of the west coast of Baja California to the north and south of the entrance to Laguna Ojo de Liebre.

Medium-sized shorebirds (Table 6)

A total of 68 175 medium-sized shorebirds was observed on the surveys, the lowest total of the three size categories. Medium-sized species were often difficult to distinguish from the air during the surveys, as they were in many cases encountered amongst large concentrations of other small and/or large shorebirds, resulting in the majority (60 647) being assigned to a general "medium-sized" category. Medium-sized species were especially common in the wetlands of Sinaloa and Sonora states in the Bahia de Santa Maria/Topolobampo areas, around the mouth of the Rio Colorado, and in the Laguna Ojo de Liebre/Guerrero Negro wetland complexes.

Black-bellied Plover. Some 1444 Black-bellied Plovers were identified during the surveys, with the largest numbers of birds being observed around the delta of the Rio Colorado, especially on the western side towards San Felipe and on the bays to the east around Puerto Peñasco. The species was identified regularly in the wetlands on the west coast of Baja California, including the Laguna Ojo de Liebre, Laguna San Ignacio, and Bahia Magdalena. Relatively few were identified on the wetlands between Culiacan and Los Mochis in Sinaloa State. The species appeared to prefer areas with firm intertidal substrates.

Yellowlegs. The majority of the 763 yellowlegs identified on the surveys occurred in the wetlands of Sinaloa State, including those in the Culiacan/Los Mochis area, Estero Tobari, and the Estero Lobos/Estero los Algodones area. Very few were identified in the wetlands of the Baja California peninsula.

Red Knot. Flocks of Red Knots were identified at several locations, including Bahia Adair and the Laguna Ojo de Liebre/Guerrero Negro wetland complex. Ground observations at Bahia de Santa Maria indicated that knots were found regularly amongst flocks of medium-sized shorebirds, and it is likely that many more winter in the area than were identified from the air. Knots were found on relatively firm intertidal habitats.

Dowitchers. Most of the 4670 dowitchers identified from the air were thought to be Long-billed Dowitchers. The species was most common in the wetlands of Sinaloa and Sonora states, especially around Culiacan/Los Mochis and in the delta of the Rio Colorado.

Large shorebirds (Table 7)

Large shorebirds made up the second most numerous category found on the surveys, with a total of 117 773. Large shorebirds were particularly abundant in relation to the other categories in the wetlands on the west coast of Baja California, in some cases outnumbering even peeps (except in the Laguna de Ojo Liebre); they were also common in the major wetlands of the states of Sinaloa and Sonora.

Black-necked Stilt. Most of the 953 stilts identified on the surveys were found in the estuary of the Rio Colorado and in the wetlands of Sinaloa and Sonora states between Culiacan and Guaymas.

American Avocet. American Avocets were the most numerous species (30 643) identified amongst the large shorebirds, and the wetlands of Sinaloa and Sonora states appear to make up an important wintering area for the species. Avocets were found in open pans in wetlands some distance from the shore as well as in brackish coastal habitats. Relatively few were found on the wetlands of the west coast of Baja California.

Marbled Godwit. Marbled Godwits (30 466) were almost as abundant as American Avocets but were rather more widely distributed, being found throughout the major wetlands of both the Sinaloa/Sonora states and the west coast of Baja California. Largest numbers occurred in the latter region in Laguna San Ignacio and Laguna de Ojo Liebre/ Guerrero Negro.

Willet. A total of 17 497 Willets was observed on the surveys. The species was widely distributed in wetlands throughout the area, with largest numbers being recorded in the delta of the Rio Colorado.

Habitat conditions

Habitat conditions during the 1992 surveys were especially wet throughout the states of Sinaloa and Sonora as a result of considerable rainfall during the preceding months. Shallow water had flooded many areas of open mud bordering most of the wetlands encountered; although the habitat was reported to be much more extensive than usual (J.L. Salomon, pers. commun.), relatively few birds were encountered in such places. An enormous area of open shallow water was found to the east of the main channel of the Rio Colorado, although few shorebirds made use of the area.

Discussion

The present surveys have identified several wintering areas of major international importance for Nearctic shorebirds in northwest Mexico. The most extensive areas of good shorebird habitat were found in the states of Sinaloa and Sonora between Culiacan and Guaymas, in the upper Gulf of California at the delta of the Rio Colorado, and in the wetlands to the east of the delta, as well as on the Pacific coast of the Baja California peninsula, especially at the Laguna Ojo de Liebre and Laguna Guerrero Negro.

The wetlands between Culiacan and Los Mochis held more than 166 600 shorebirds and contained a wide variety of habitats, including barrier beaches, mangroves, intertidal flats of a variety of substrate types, shallow flooded areas of mud and marsh, and different salinity regimes, which supported a high diversity of species. Several species appeared to be more common in these areas than on the Pacific coast of Baja California, including American Avocets, Black-necked Stilts, yellowlegs, and possibly dowitchers. The availability of soft mudflats is reflected in the high numbers of small sandpipers, especially Western Sandpipers, found throughout the area.

Extensive wetland habitats were found bordering Estero Tobari and Estero Lobos/Estero los Algodones, and these areas together supported more than 110 000 shorebirds. Habitats were apparently considerably more extensive than usual during the surveys because of the wet conditions.

Estuaries and wetlands on the Pacific coast of Baja California tended to have higher numbers of large species — especially Marbled Godwits and Willets, as well as Black-bellied Plovers — than the wetlands of Sinaloa and Sonora states. The most important area discovered on the surveys was the Laguna Ojo de Liebre, with a total of some 256 900 shorebirds. This area contained large expanses of mudflats in front of the marshes bordering the long shoreline of the lagoon and supported a wide variety of species. The lagoon itself is bordered by enormous areas of salt evaporation pans, which were not covered in any detail during the present surveys; the salt pans that were sampled did not contain any significant numbers of wintering shorebirds.

The outer parts of the delta of the Rio Colorado contain extensive mudflats, which supported large numbers of peeps, especially towards the seaward ends of Isla

Montague and Isla Pelicano, two low, flat, and mostly unvegetated islands. The western side of the delta running south to San Felipe appeared to consist of firmer flats, and large concentrations of medium-sized and large shorebirds were encountered in this area. Most of the outer delta consists of bare mud, with salt marshes colonizing the inner shores of the islands and mainland shore towards the main channel of the Rio Colorado itself. Further significant areas of habitat occur to the east of the Rio Colorado in Bahia Adair and Bahia San Jorge, which supported moderate numbers of shorebirds.

The survey results indicate that the four major wetland complexes described above would all qualify for inclusion in the Western Hemisphere Shorebird Reserve Network in one of the two most important site categories. All exceed the criterion of supporting at least 100 000 shorebirds during the year to qualify as "International" reserves. No information is available on shorebird populations using these areas during either northward or southward migration; when the additional numbers of birds likely to use the areas during these periods are taken into account, it is likely that at least some will be found to support more than 500 000 shorebirds, the criterion for designation as a "Hemispheric" reserve. Further information on shorebird use of the areas during migration periods would be most valuable.

In addition to the wetland complexes of northwest Mexico, the ocean beaches of the Pacific coast of Baja California and of the outer barrier islands on the east coast of the Gulf of California supported moderate numbers of Sanderlings. Further information on the size of Sanderling populations in adjacent regions is required to assess the importance of these coastal sectors.

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Table 3
Summary of totals of small, medium-sized, large, and unidentified shorebirds observed during 1992 aerial surveys along the coast of northwest Mexico

Sector No.	Sector name	Small	Medium-sized	Large	Unidentified	Total
1		757	1	12	0	770
2	Bahia Playa Colorada/de Santa Maria	44 770	3 911	3 575	24 265	76 521
3	Bahia Navachiste/San Ignacio	23 880	6 335	3 490	0	33 705
4		885	0	5	0	890
5	Bahia Lechuguilla/Topolobampo	26 905	5 457	16 026	8 033	56 421
6		891	202	134	0	1 227
7	Estero Agiabampo/Bahia Jitzamuri	13 761	3 221	2 615	0	19 597
8	Bahia Yavaros	10 153	2 477	1 758	0	14 388
9		508	42	403	0	953
10	Estero Tobari	33 010	3 472	4 723	0	41 205
11	Estero Lobos	58 040	6 102	5 045	0	69 187
12	Estero los Algodones wetlands	5 150	1 045	1 066	0	7 261
13		670	370	365	0	1 405
14		0	0	0	0	0
15	Estero Tastiota	450	2	2	0	454
16		60	2	2	0	64
17	Estero Santa Cruz	1 160	336	199	0	1 695
18		149	13	110	0	272
19		113	72	90	0	275
20		209	159	29	0	397
21	Bahia San Jorge/Estero la Pinta	5 706	400	527	0	6 633
22	Bahia Adair	8 185	2 247	2 268	0	12 700
23		307	66	76	0	449
24	Rio Colorado estuary	131 060	8 578	24 106	0	163 744
25		22	265	219	0	506
26		0	0	4	0	4
27		0	1	11	0	12
28		12	0	0	0	12
29		0	10	2	0	12
30		0	0	0	0	0
31		0	0	0	0	0
32		1	13	3	0	17
33	Ensenada La Paz	51	84	84	0	219
34		0	3	4	0	7
35		0	0	0	0	0
36		0	1	0	0	1
37		950	0	0	0	950
38		145	0	7	0	152
39	Bahia Magdalena/las Almejas	907	215	1 267	0	2 389
40	Boca las Animas/Canal San Carlos	663	489	687	0	1 839
41		137	1	0	0	138
42		261	15	51	0	327
43	Laguna San Ignacio	4 625	1 580	10 197	0	16 402
44		2 095	987	682	0	3 764
45		995	9	50	0	1 054
46		170	109	83	0	362
47	Laguna Ojo de Liebre	177 845	17 413	32 603	29 078	256 939
48		263	0	2	0	265
49	Laguna Guerrero Negro	3 210	970	1 599	5 000	10 779
50		450	836	1 091	0	2 377
51		800	99	414	0	1 313
52		80	61	21	0	162
53		37	35	78	0	150
54	Bahia San Quintin	2 241	240	1 898	0	4 379
55		73	62	58	0	193
56		330	150	25	0	505
57		65	17	7	0	89
Total		563 207	68 175	117 773	66 376	815 531

Table 4
Percentages of totals of small, medium-sized, large, and unidentified shorebirds observed during 1992 aerial surveys along the coast of northwest Mexico

Sector No.	Sector name	Small	Medium-sized	Large	Unidentified	Total
1		0.1	0	0	0	0.1
2	Bahia Playa Colorada/de Santa Maria	7.9	5.7	3	36.6	9.4
3	Bahia Navachiste/San Ignacio	4.2	9.3	3	0	4.1
4		0.2	0	0	0	0.1
5	Bahia Lechuguilla/Topolobampo	4.8	8	13.6	12.1	6.9
6		0.2	0.3	0.1	0	0.2
7	Estero Agiabampo/Bahia Jitzamuri	2.4	4.7	2.2	0	2.4
8	Bahia Yavaros	1.8	3.6	1.5	0	1.8
9		0.1	0.1	0.3	0	0.1
10	Estero Tobari	5.9	5.1	4	0	5.1
11	Estero Lobos	10.3	9	4.3	0	8.5
12	Estero los Algodones wetlands	0.9	1.5	0.9	0	0.9
13		0.1	0.5	0.3	0	0.2
14		0	0	0	0	0
15	Estero Tastiota	0.1	0	0	0	0.1
16		0	0	0	0	0
17	Estero Santa Cruz	0.2	0.5	0.2	0	0.2
18		0	0	0.1	0	0
19		0	0.1	0.1	0	0
20		0	0.2	0	0	0
21	Bahia San Jorge/Estero la Pinta	1	0.6	0.4	0	0.8
22	Bahia Adair	1.5	3.3	1.9	0	1.6
23		0.1	0.1	0.1	0	0.1
24	Rio Colorado estuary	23.3	12.6	20.5	0	20.1
25		0	0.4	0.2	0	0.1
26		0	0	0	0	0
27		0	0	0	0	0
28		0	0	0	0	0
29		0	0	0	0	0
30		0	0	0	0	0
31		0	0	0	0	0
32		0	0	0	0	0
33	Ensenada La Paz	0	0.1	0.1	0	0
34		0	0	0	0	0
35		0	0	0	0	0
36		0	0	0	0	0
37		0.2	0	0	0	0.1
38		0	0	0	0	0
39	Bahia Magdalena/las Almejas	0.2	0.3	1.1	0	0.3
40	Boca las Animas/Canal San Carlos	0.1	0.7	0.6	0	0.2
41		0	0	0	0	0
42		0	0	0	0	0
43	Laguna San Ignacio	0.8	2.3	8.7	0	2
44		0.4	1.4	0.6	0	0.5
45		0.2	0	0	0	0.1
46		0	0.2	0.1	0	0
47	Laguna Ojo de Liebre	31.6	25.5	27.7	43.8	31.5
48		0	0	0	0	0
49	Laguna Guerrero Negro	0.6	1.4	1.4	7.5	1.3
50		0.1	1.2	0.9	0	0.3
51		0.1	0.1	0.4	0	0.2
52		0	0.1	0	0	0
53		0	0.1	0.1	0	0
54	Bahia San Quintin	0.4	0.4	1.6	0	0.5
55		0	0.1	0	0	0
56		0.1	0.2	0	0	0.1
57		0	0	0	0	0
Total		100	100	100	100	100

Table 5
Totals of small shorebirds observed during 1992 aerial surveys along the coast of northwest Mexico[a]

Sector No.	Sector name	SAND	PEEP	Total
1		757	0	757
2	Bahia Playa Colorada/ de Santa Maria	0	44 770	44 770
3	Bahia Navachiste/ San Ignacio	0	23 880	23 880
4		82	803	885
5	Bahia Lechuguilla/ Topolobampo	0	26 905	26 905
6		247	644	891
7	Estero Agiabampo/ Bahia Jitzamuri	0	13 761	13 761
8	Bahia Yavaros	73	10 080	10 153
9		328	180	508
10	Estero Tobari	0	33 010	33 010
11	Estero Lobos	0	58 040	58 040
12	Estero los Algodones wetlands	0	5 150	5 150
13		140	530	670
14		0	0	0
15	Estero Tastiota	0	450	450
16		60	0	60
17	Estero Santa Cruz	0	1 160	1 160
18		149	0	149
19		63	50	113
20		209	0	209
21	Bahia San Jorge/ Estero la Pinta	20	5 686	5 706
22	Bahia Adair	385	7 800	8 185
23		146	161	307
24	Rio Colorado estuary	0	131 060	131 060
25		0	22	22
26		0	0	0
27		0	0	0
28		12	0	12
29		0	0	0
30		0	0	0
31		0	0	0
32		1	0	1
33	Ensenada La Paz	0	51	51
34		0	0	0
35		0	0	0
36		0	0	0
37		0	950	950
38		35	110	145
39	Bahia Magdalena/ las Almejas	170	737	907
40	Boca las Animas/ Canal San Carlos	3	660	663
41		137	0	137
42		259	2	261
43	Laguna San Ignacio	65	4 560	4 625
44		373	1 722	2 095
45		995	0	995
46		170	0	170
47	Laguna Ojo de Liebre	30	177 815	177 845
48		263	0	263
49	Laguna Guerrero Negro	170	3 040	3 210
50		0	450	450
51		800	0	800
52		80	0	80
53		37	0	37
54	Bahia San Quintin	10	2 231	2 241
55		42	31	73
56		290	40	330
57		45	20	65
Total		6 646	556 561	563 207

[a] For abbreviations, see Table 2.

Table 6
Totals of medium-sized shorebirds observed during 1992 aerial surveys along the coast of northwest Mexico[a]

Sector No.	Sector name	BBPL	YELL	WATA	RUTU	SURF	REKN	DOWI	Medium-sized[b]	Total
1		1	0	0	0	0	0	0	0	1
2	Bahia Playa Colorada/de Santa Maria	0	0	0	0	0	0	550	3 361	3 911
3	Bahia Navachiste/San Ignacio	4	1	0	0	0	0	100	6 230	6 335
4		0	0	0	0	0	0	0	0	0
5	Bahia Lechuguilla/Topolobampo	0	110	0	0	0	0	790	4 557	5 457
6		0	2	0	0	0	0	0	200	202
7	Estero Agiabampo/Bahia Jitzamuri	38	204	0	220	0	0	0	2 759	3 221
8	Bahia Yavaros	1	20	0	0	0	0	0	2 456	2 477
9		5	0	0	0	0	0	0	37	42
10	Estero Tobari	0	270	0	0	0	0	0	3 202	3 472
11	Estero Lobos	86	42	0	0	0	0	0	5 974	6 102
12	Estero los Algodones wetlands	5	25	0	0	0	0	700	315	1 045
13		0	0	0	0	0	0	0	370	370
14		0	0	0	0	0	0	0	0	0
15	Estero Tastiota	2	0	0	0	0	0	0	0	2
16		1	1	0	0	0	0	0	0	2
17	Estero Santa Cruz	8	0	0	0	0	0	40	288	336
18		13	0	0	0	0	0	0	0	13
19		23	0	0	7	16	0	0	26	72
20		25	1	0	6	0	0	0	127	159
21	Bahia San Jorge/Estero la Pinta	49	10	0	1	0	0	30	310	400
22	Bahia Adair	15	0	7	20	0	50	625	1 530	2 247
23		26	0	0	0	0	0	40	0	66
24	Rio Colorado estuary	803	10	0	0	0	0	1 410	6 355	8 578
25		3	0	0	2	0	0	0	260	265
26		0	0	0	0	0	0	0	0	0
27		0	0	0	0	0	0	0	1	1
28		0	0	0	0	0	0	0	0	0
29		0	0	0	0	0	0	0	10	10
30		0	0	0	0	0	0	0	0	0
31		0	0	0	0	0	0	0	0	0
32		1	0	0	0	0	0	0	12	13
33	Ensenada La Paz	2	41	0	0	0	0	0	41	84
34		0	0	0	3	0	0	0	0	3
35		0	0	0	0	0	0	0	0	0
36		0	0	0	0	0	0	0	1	1
37		0	0	0	0	0	0	0	0	0
38		0	0	0	0	0	0	0	0	0
39	Bahia Magdalena/las Almejas	19	20	0	0	0	0	10	166	215
40	Boca las Animas/Canal San Carlos	21	1	0	0	0	0	20	447	489
41		1	0	0	0	0	0	0	0	1
42		15	0	0	0	0	0	0	0	15
43	Laguna San Ignacio	48	1	0	0	0	0	0	1 531	1 580
44		10	0	2	15	0	0	0	960	987
45		9	0	0	0	0	0	0	0	9
46		10	0	3	18	0	0	0	78	109
47	Laguna Ojo de Liebre	135	1	0	0	0	120	50	17 107	17 413
48		0	0	0	0	0	0	0	0	0
49	Laguna Guerrero Negro	0	0	0	0	0	50	90	830	970
50		6	0	0	0	0	0	200	630	836
51		8	0	0	2	60	0	0	29	99
52		22	0	0	0	0	0	0	39	61
53		13	0	0	0	0	0	0	22	35
54	Bahia San Quintin	6	3	0	15	0	0	15	201	240
55		7	0	0	15	0	0	0	40	62
56		1	0	0	17	2	0	0	130	150
57		2	0	0	0	0	0	0	15	17
Total		1 444	763	12	341	78	220	4 670	60 647	68 175

[a] For abbreviations, see Table 2.
[b] This category contains those medium-sized shorebirds that could not be identified at a species level.

Table 7
Totals of large shorebirds observed during 1992 aerial surveys along the coast of northwest Mexico[a]

Sector No.	Sector name	AMOY	BLOY	BNST	AMAV	MAGO	WHIM	LBCU	WILL	Large[b]	Total
1		0	0	0	0	1	3	0	8	0	12
2	Bahia Playa Colorada/ de Santa Maria	0	0	78	1 173	275	0	16	250	1 783	3 575
3	Bahia Navachiste/San Ignacio	0	0	5	1 211	244	7	12	266	1 745	3 490
4		0	0	0	0	1	1	0	3	0	5
5	Bahia Lechuguilla/ Topolobampo	1	0	138	10 355	1 543	2	18	276	3 693	16 026
6		0	0	0	50	3	7	0	74	0	134
7	Estero Agiabampo/ Bahia Jitzamuri	2	0	53	1 777	211	30	30	512	0	2 615
8	Bahia Yavaros	6	0	0	250	1 050	4	0	152	296	1 758
9		1	2	35	300	0	7	0	58	0	403
10	Estero Tobari	0	0	16	2 406	1 151	4	0	430	716	4 723
11	Estero Lobos	0	0	30	2 640	725	24	0	671	955	5 045
12	Estero los Algodones wetlands	3	0	40	0	500	10	1	320	192	1 066
13		0	0	0	140	110	0	0	115	0	365
14		0	0	0	0	0	0	0	0	0	0
15	Estero Tastiota	0	0	0	0	0	0	0	2	0	2
16		0	0	0	0	0	0	0	2	0	2
17	Estero Santa Cruz	0	0	0	70	62	10	0	46	11	199
18		3	0	0	0	40	31	0	36	0	110
19		1	0	0	0	26	7	0	56	0	90
20		0	1	0	0	0	3	0	25	0	29
21	Bahia San Jorge/ Estero la Pinta	1	0	0	0	157	14	0	289	66	527
22	Bahia Adair	2	0	0	0	1 517	18	0	731	0	2 268
23		8	0	0	0	0	0	0	68	0	76
24	Rio Colorado estuary	121	0	376	9 391	3 157	25	73	7 971	2 992	24 106
25		0	2	0	0	76	3	0	20	118	219
26		0	0	0	0	4	0	0	0	0	4
27		5	0	0	0	4	1	0	1	0	11
28		0	0	0	0	0	0	0	0	0	0
29		0	0	0	0	0	0	0	2	0	2
30		0	0	0	0	0	0	0	0	0	0
31		0	0	0	0	0	0	0	0	0	0
32		0	0	0	0	1	1	0	1	0	3
33	Ensenada La Paz	4	0	0	40	11	15	2	12	0	84
34		0	0	0	0	0	0	0	4	0	4
35		0	0	0	0	0	0	0	0	0	0
36		0	0	0	0	0	0	0	0	0	0
37		0	0	0	0	0	0	0	0	0	0
38		2	0	0	0	0	0	0	5	0	7
39	Bahia Magdalena/las Almejas	9	0	0	0	912	18	3	315	10	1 267
40	Boca las Animas/ Canal San Carlos	0	0	0	0	269	7	0	121	290	687
41		0	0	0	0	0	0	0	0	0	0
42		0	0	0	0	20	2	0	29	0	51
43	Laguna San Ignacio	0	0	182	200	8 206	2	17	1 590	0	10 197
44		1	0	0	0	541	0	0	40	100	682
45		0	0	0	0	0	0	50	0	0	50
46		1	0	0	0	0	27	0	1	54	83
47	Laguna Ojo de Liebre	0	0	0	640	7 282	9	30	2 139	22 503	32 603
48		0	0	0	0	0	0	2	0	0	2
49	Laguna Guerrero Negro	0	0	0	0	515	2	3	179	900	1 599
50		0	0	0	0	548	15	46	458	24	1 091
51		0	0	0	0	37	41	36	0	300	414
52		0	0	0	0	0	11	10	0	0	21
53		0	0	0	0	20	10	0	48	0	78
54	Bahia San Quintin	0	0	0	0	1 240	20	30	124	484	1 898
55		0	0	0	0	2	14	0	32	10	58
56		0	2	0	0	3	5	0	15	0	25
57		0	0	0	0	2	0	5	0	0	7
Total		171	7	953	30 643	30 466	410	384	17 497	37 242	117 773

[a] For abbreviations, see Table 2.
[b] This category contains those large shorebirds that could not be identified at a species level.

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